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FUJITSU Storage
ETERNUS DX
Configuration Guide -Server Connection-

(Fibre Channel/FCoE/iSCSI/SAS) for Linux
device-mapper multipath

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Preface

This manual briefly explains the operations that need to be performed by the user in order to connect an ETERNUS DX Disk storage system or an ETERNUS DX200F All Flash Array to a server running Linux or Oracle Linux via Fibre Channel/FCoE/iSCSI/SAS interface and using the device-mapper multipath.

This manual should be used in conjunction with any other applicable user manuals, such as those for the ETERNUS DX Disk storage system, ETERNUS DX200F All Flash Array, server, OS, drivers, and interface card (Fibre Channel card, iSCSI card, SAS card, FCoE card) that is used.

Refer to "FUJITSU Storage ETERNUS DX Configuration Guide -Server Connection- Notations" for the notations used in this manual such as product trademarks and product names.

This manual is designed for use with the following storage systems:

- ETERNUS DX60 S3/DX100 S3/DX200 S3 Disk storage system
- ETERNUS DX500 S3/DX600 S3 Disk storage system
- ETERNUS DX60 S2/DX80 S2/DX90 S2 Disk storage system
- ETERNUS DX410 S2/DX440 S2 Disk storage system
- ETERNUS DX8100 S2/DX8700 S2 Disk storage system
- ETERNUS DX60/DX80/DX90 Disk storage system
- ETERNUS DX410/DX440 Disk storage system
- ETERNUS DX8100/DX8400/DX8700 Disk storage system
- ETERNUS DX200F All Flash Array

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The Contents and Structure of this Manual

This manual is composed of the following five chapters.

- "Chapter 1 Workflow" (page 7)

  This chapter describes how to connect the ETERNUS DX to a server.

- "Chapter 2 For Red Hat Enterprise Linux 7, Red Hat Enterprise Linux 6, or Oracle Linux " (page 8)

  This chapter describes how to set up a multipath environment, and the points to be checked after setup when the server is running RHEL7, RHEL6, or Oracle Linux.

- "Chapter 3 For Red Hat Enterprise Linux 5" (page 13)

  This chapter describes how to set up a multipath environment, and the points to be checked after setup when the server is running RHEL5.

- "Chapter 4 For SUSE Linux Enterprise Server 12 or SUSE Linux Enterprise Server 11" (page 17)

  This chapter describes how to set up a multipath environment, and the points to be checked after setup when the server is running SLES12 or SLES11.

- "Chapter 5 For SUSE Linux Enterprise Server 10" (page 22)

  This chapter describes how to set up a multipath environment, and the points to be checked after setup when the server is running SLES10.

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Chapter 1
Workflow

Set up and check the device-mapper multipath. The workflow is shown below.

Workflow

1 **Setting Up the device-mapper multipath**
Set up the device-mapper multipath.



2 **Checking the device-mapper multipath**
Check the device after the device-mapper multipath is set up.

Reference list

This manual provides a different section for each OS vendor and version. Refer to the appropriate chapter for the OS or the version that is being used.

OS	Reference
Red Hat Enterprise Linux 7, Red Hat Enterprise Linux 6, or Oracle Linux	"Chapter 2 For Red Hat Enterprise Linux 7, Red Hat Enterprise Linux 6, or Oracle Linux " (page 8)
Red Hat Enterprise Linux 5	"Chapter 3 For Red Hat Enterprise Linux 5" (page 13)
SUSE Linux Enterprise Server 12 or SUSE Linux Enterprise Server 11	"Chapter 4 For SUSE Linux Enterprise Server 12 or SUSE Linux Enterprise Server 11" (page 17)
SUSE Linux Enterprise Server 10 SP3 or later	"5.1 For SUSE Linux Enterprise Server 10 SP3 or Later" (page 22)
SUSE Linux Enterprise Server 10 SP2 or earlier	"5.2 For SUSE Linux Enterprise Server 10 SP2 or Earlier" (page 26)

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Chapter 2
For Red Hat Enterprise Linux 7, Red Hat Enterprise Linux 6, or Oracle Linux

This chapter describes how to set up a multipath environment, and the points to be checked after setup when the server is running RHEL7, RHEL6, or Oracle Linux.

2.1 Setting Up the device-mapper multipath

Set up the multipath environment.

2.1.1 Preparation

device-mapper multipath uses Red Hat Package Manager (RPM) packages.

If the RPM versions are not listed in the Server Support Matrix, use the RPM supplied as standard in the OS.

Check that the "device-mapper-multipath" package is installed. If this package is not installed, install the package before setting up a multipath configuration.

2.1.2 Editing "/etc/multipath.conf"

Edit the device-mapper multipath configuration file.

Create a configuration file as follows.

Procedure

1 Execute the "mpathconf" command.

Executing this command registers multipath daemon in Services and creates the configuration file (/etc/multipath.conf).

```
# mpathconf --enable
```

If the configuration file is not created when the command above is executed, copy the "/usr/share/doc/device-mapper-multipath-X.X.X/multipath.conf" file in the "/etc" directory and then execute the "mpathconf--enable" command again.

2 If any internal disks or other devices are to be excluded from the multipath configuration, specify the excluded devices in the "blacklist" section. If required, refer to the Red Hat web-site for details. Also refer to the Red Hat web-site for reference purposes when Oracle Linux is used.

```
blacklist {
}
```


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3 Confirm that the following description is present.

```
## Use user friendly names, instead of using WWIDs as names.
defaults {
                user_friendly_names yes   (*1)
                queue_without_daemon no   (*2)
#               find_multipaths yes       (*3)
}
```

***1:** For "user_friendly_names", "no" can be specified as necessary for middleware or applications.

***2:** Add the "queue_without_daemon no" line for iSCSI connections.

***3:** If there is a "find_multipaths yes" line, add a "#" to the beginning of the line to comment out the line.

Caution

Enter a space between "defaults" and "{".

4 Add the following lines at the end of the file.

- For ETERNUS DX storage systems

  (Example: Connecting the ETERNUS DX80)

```
devices {
         device {
                 vendor                  "FUJITSU"
                 product                 "ETERNUS_DXL"
                 prio                    alua
                 path_grouping_policy    group_by_prio
                 path_selector           "round-robin 0"
                 failback                immediate
                 no_path_retry           0 (*1)
                 path_checker            tur
                 dev_loss_tmo            2097151 (*2)
                 fast_io_fail_tmo        1
          }
}
```

***1:** When using the Storage Cluster function, or a 10Gbit/s iSCSI connection with an ETERNUS DX S3 series, specify "no_path_retry 10".

***2:** For Oracle Linux 5.x UEK or Oracle Linux 5.x, the "dev_loss_tmo" line is not required.

Caution

- Enter a space between "devices" and "{".
- Enter a space between "device" and "{".
- The "dev_loss_tmo" parameter value is not applied correctly when a Brocade Fibre Channel card is used. This may cause the device file to be cleared if the ETERNUS DX is turned off due to a power failure. If this occurs, the server may have to be rebooted.

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The "product" value varies depending on the ETERNUS DX that is to be connected.
Refer to the following table for the appropriate value.

ETERNUS DX to be used	"product" value
DX60 S3/DX100 S3/DX200 S3, DX200F, DX60/DX60 S2, DX80/DX80 S2, DX90/DX90 S2	ETERNUS_DXL
DX500 S3/DX600 S3	ETERNUS_DXM
DX400/DX400 S2 series	ETERNUS_DX400
DX8000/DX8000 S2 series	ETERNUS_DX8000

End of procedure

2.1.3 Enabling the device-mapper multipath

Enable the device-mapper multipath, using the following commands.
Check that device-mapper multipath can be started normally after executing the command.

```
# service multipathd start
```

When device-mapper multipath has already started, reload device-mapper multipath.

```
# service multipathd reload
```

2.1.4 Rebooting the Linux Server

Reboot the Linux server.
Example:

```
# shutdown -r now
```


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2.2 Checking the device-mapper multipath

After they have been enabled, confirm the device-mapper multipath settings.

2.2.1 Recognizing the Post device-mapper multipath LUNs

Check the device file created by the device-mapper multipath.

Example:

```
# ls -l /dev/mapper/
total 0
crw-rw----. 1 root root 10, 58 Apr 14 09:01 control
lrwxrwxrwx. 1 root root      7 Apr 14 09:01 mpathh -> ../dm-1
lrwxrwxrwx. 1 root root      7 Apr 14 09:01 mpathi -> ../dm-0
lrwxrwxrwx. 1 root root      7 Apr 14 09:01 mpathj -> ../dm-5
lrwxrwxrwx. 1 root root      7 Apr 14 09:01 mpathk -> ../dm-6
lrwxrwxrwx. 1 root root      7 Apr 14 09:01 mpathl -> ../dm-3
lrwxrwxrwx. 1 root root      7 Apr 14 09:01 mpathm -> ../dm-2
lrwxrwxrwx. 1 root root      7 Apr 14 09:01 mpathn -> ../dm-4
```

2.2.2 Checking the device-mapper multipath Status and Created Devices

Check the path status using the "multipath -ll" command. Check that the recognized status of the devices for all the paths that are assigned to the server is normal.

- Multipath is in normal status (This example shows when two paths are used to connect to the ETERNUS DX80)

  Check that multipathing is configured in the two block devices and "active ready" is displayed for each path status.

```
# multipath -ll

mpathh (3600000e00d0000000001000000200000) dm-1 FUJITSU,ETERNUS_DXL
size=2.0G features='1 queue_if_no_path' hwhandler='0' wp=rw
|-+- policy='round-robin 0' prio=50 status=active
| '- 1:0:0:0 sdb 8:16  active ready running
'-+- policy='round-robin 0' prio=10 status=
  '- 2:0:0:0 sdi 8:128 active ready running
```

When the path status is normal, "active ready" is displayed.

Two block device names are displayed for a two-path configuration.

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- Multipath (the "2:0:0:X" side) is in error status (This example shows when two paths are used to connect to the ETERNUS DX80)

```
# multipath -ll

mpathh (3600000e00d0000000001000000200000) dm-1 FUJITSU,ETERNUS_DXL
size=2.0G features='1 queue_if_no_path' hwhandler='0' wp=rw
`-+- policy='round-robin 0' prio=50 status=active
  `- 1:0:0:0 sdb 8:16  active ready running
```

The status for the failed path may not be displayed depending on the OS version.

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Chapter 3
For Red Hat Enterprise Linux 5

This chapter describes how to set up a multipath environment, and the points to be checked after setup when the server is running RHEL5.

3.1 Setting Up the device-mapper multipath

Set up the multipath environment.

3.1.1 Preparation

device-mapper multipath uses Red Hat Package Manager (RPM) packages.

If the RPM versions are not listed in the Server Support Matrix, use the RPM supplied as standard in the OS.

3.1.2 Editing "/etc/multipath.conf"

Edit the device-mapper multipath configuration file.

Create a configuration file as follows.

Procedure

1 Comment out the following three lines in "/etc/multipath.conf".

```
# blacklist {
# devnode "*"
# }
```

If any internal disks or other devices are to be excluded from the multipath configuration, specify the excluded devices in the "blacklist" section. If required, refer to the Red Hat web-site for details.

2 Confirm that the following description is present.

```
## Use user friendly names, instead of using WWIDs as names.
defaults {
         user_friendly_names yes
}
```

Caution

Enter a space between "defaults" and "{".

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3 Add the following lines at the end of the file.

- For ETERNUS DX storage systems

  (This example is for the ETERNUS DX80)

```
devices {
         device {
                 vendor                  "FUJITSU"
                 product                 "ETERNUS_DXL"
                 prio_callout            "/sbin/mpath_prio_alua %d"
                 path_grouping_policy    group_by_prio
                 path_selector           "round-robin 0"
                 failback                immediate
                 no_path_retry           10
                 path_checker            tur
                }
        }
```

Caution

- Enter a space between "devices" and "{".
- Enter a space between "device" and "{".

The "product" value varies depending on the ETERNUS DX that is to be connected.

Refer to the following table for the appropriate value.

ETERNUS DX to be used	"product" value
DX60 S3/DX100 S3/DX200 S3, DX200F, DX60/DX60 S2, DX80/DX80 S2, DX90/DX90 S2	ETERNUS_DXL
DX500 S3/DX600 S3	ETERNUS_DXM
DX400/DX400 S2 series	ETERNUS_DX400
DX8000/DX8000 S2 series	ETERNUS_DX8000

End of procedure

3.1.3 Enabling the device-mapper multipath

Enable the device-mapper multipath, using the following commands.

```
# multipath -v 1
# chkconfig --add multipathd
# chkconfig multipathd on
# multipath
# /etc/init.d/multipathd start
```


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3.1.4 Rebooting the Linux Server

Reboot the Linux server.

Example:

```
# shutdown -r now
```

3.2 Checking the device-mapper multipath

After they have been enabled, confirm the device-mapper multipath settings.

3.2.1 Recognizing the Post device-mapper multipath LUNs

Check the device file created by the device-mapper multipath.

Example:

```
# cd /dev/mapper
# ls -l
crw------- 1 root root  10,  63 Oct 17 17:41 control
brw-rw---- 1 root disk 253,   0 Oct 17 17:41 mpath0
brw-rw---- 1 root disk 253,   1 Oct 17 17:41 mpath1
brw-rw---- 1 root disk 253,  10 Oct 17 17:41 mpath10
brw-rw---- 1 root disk 253,  99 Oct 17 17:41 mpath100
                      :
brw-rw---- 1 root disk 253, 245 Oct 17 17:41 mpath246
brw-rw---- 1 root disk 253, 246 Oct 17 17:41 mpath247
brw-rw---- 1 root disk 253, 247 Oct 17 17:41 mpath248
brw-rw---- 1 root disk 253, 248 Oct 17 17:41 mpath249
```

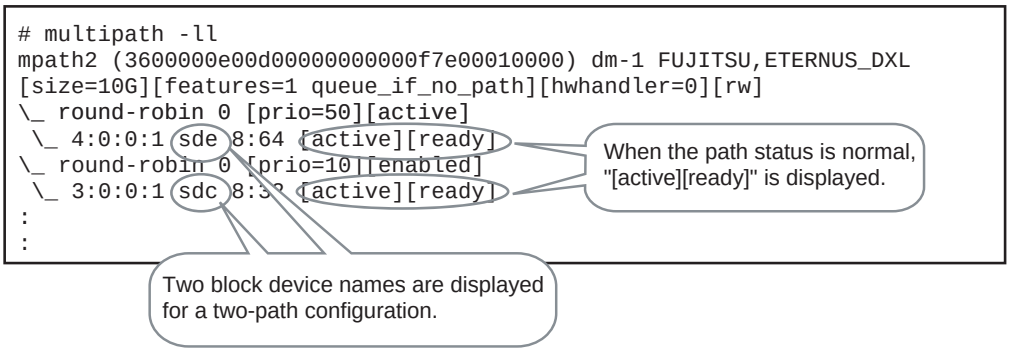

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3.2.2 Checking the device-mapper multipath Status and Created Devices

Check the path status using the "multipath -ll" command. Check that the recognized status of the devices for all the paths that are assigned to the server is normal.

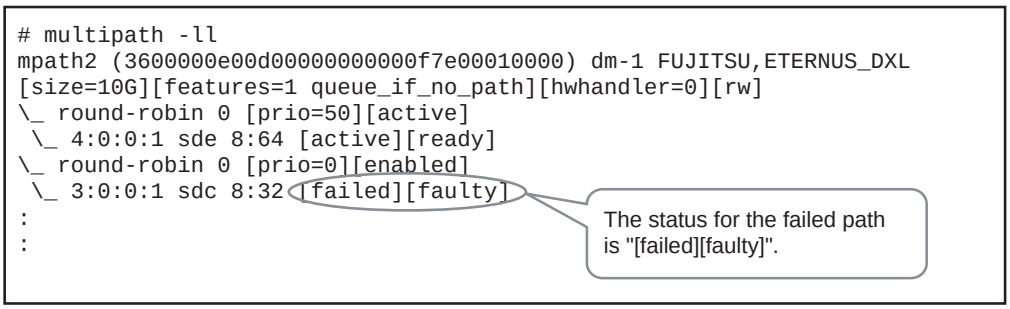
- Multipath is in normal status (This example shows when two paths are used to connect to the ETERNUS DX80)

  Check that multipathing is configured in the two block devices and "active ready" is displayed for each path status.




```
# multipath -ll
mpath2 (3600000e00d00000000000f7e00010000) dm-1 FUJITSU,ETERNUS_DXL
[size=10G][features=1 queue_if_no_path][hwhandler=0][rw]
\_ round-robin 0 [prio=50][active]
 \_ 4:0:0:1 sde 8:64 [active][ready]
\_ round-robin 0 [prio=10][enabled]
 \_ 3:0:0:1 sdc 8:32 [active][ready]
:
:
```

- Multipath (the "3:0:0:X" side) is in error status (This example shows when two paths are used to connect to the ETERNUS DX80)




```
# multipath -ll
mpath2 (3600000e00d00000000000f7e00010000) dm-1 FUJITSU,ETERNUS_DXL
[size=10G][features=1 queue_if_no_path][hwhandler=0][rw]
\_ round-robin 0 [prio=50][active]
 \_ 4:0:0:1 sde 8:64 [active][ready]
\_ round-robin 0 [prio=0][enabled]
 \_ 3:0:0:1 sdc 8:32 [failed][faulty]
:
:
```


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Chapter 4
For SUSE Linux Enterprise Server 12 or SUSE Linux Enterprise Server 11

This chapter describes how to set up a multipath environment, and the points to be checked after setup when the server is running SLES12 or SLES11.

4.1 Setting Up the device-mapper multipath

Set up the multipath environment.

4.1.1 Preparation

device-mapper multipath uses Red Hat Package Manager (RPM) packages.

If the RPM versions are not listed in the Server Support Matrix, use the RPM supplied as standard in the OS.

4.1.2 Editing "/etc/multipath.conf"

Edit the device-mapper multipath configuration file.

Create a configuration file as follows.

Procedure

1 Copy the "/usr/share/doc/packages/multipath-tools/multipath.conf.synthetic" file to "/etc".

```
# cp /usr/share/doc/packages/multipath-tools/multipath.conf.synthetic /etc/multipath.conf
```

2 Add the following lines to the file.

Add the following lines at the end of the "defaults" section.

```
defaults {
          user_friendly_names yes
        }
```


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Add the following lines at the end of the "devices" section.

(This example is for the ETERNUS DX410)

```
devices {
        device {
               vendor                "FUJITSU"
               product               "ETERNUS_DX400"
               prio                  alua
               path_grouping_policy  group_by_prio
               path_selector         "round-robin 0"
               failback              immediate
               no_path_retry         0 (*1)
               path_checker          tur
               dev_loss_tmo          2147483
               fast_io_fail_tmo      1
              }
       }
```

***1:** When using the Storage Cluster function, specify "no_path_retry 10".

Caution

- Enter a space between "defaults" and "{".
- Enter a space between "devices" and "{".
- Enter a space between "device" and "{".
- The "dev_loss_tmo" parameter value is not applied correctly when a Brocade Fibre Channel card is used. This may cause the device file to be cleared if the ETERNUS DX is turned off due to a power failure. If this occurs, the server may have to be rebooted.

The "product" value varies depending on the ETERNUS DX that is to be connected.

Refer to the following table for the appropriate value.

ETERNUS DX to be used	"product" value
DX60 S3/DX100 S3/DX200 S3, DX200F, DX60/DX60 S2, DX80/DX80 S2, DX90/DX90 S2	ETERNUS_DXL
DX500 S3/DX600 S3	ETERNUS_DXM
DX400/DX400 S2 series	ETERNUS_DX400
DX8000/DX8000 S2 series	ETERNUS_DX8000

If any internal disks or other devices are to be excluded from the multipath configuration, specify the excluded devices in the "blacklist" section. Refer to the Novell web-site for details.

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Caution

- For SLES12, if any internal disks are to be excluded from the multipath configuration, make sure to specify the excluded devices in the "blacklist" section.
- For SLES11 SP2, the following patches (or patches that are newer than those listed below) must be applied to enable the settings. "xxx" indicates the architecture name (for example, x86).
  - kpartx-0.4.9-0.66.1.xxx.rpm
  - multipath-tools-0.4.9-0.66.1.xxx.rpm

End of procedure

4.1.3 Enabling the device-mapper multipath

Enable the device-mapper multipath, using the following commands.

- For SUSE Linux Enterprise Server 12

  1 Create an initial RAM disk.

  Create an initial RAM disk image file to match the kernel being used. Refer to manuals supplied with the Fibre Channel cards for details.

  2 Execute the following command.

```
# systemctl enable multipathd.service
# systemctl start multipathd.service
```

- For SUSE Linux Enterprise Server 11

  Execute the following command.

```
# insserv boot.multipath multipathd
# chkconfig multipathd on
# chkconfig boot.multipath on
# /etc/init.d/boot.multipath start
# /etc/init.d/multipathd start
```

4.1.4 Rebooting the Linux Server

Reboot the Linux server.

Example:

```
# shutdown -r now
```

4.2 Checking the device-mapper multipath

After they have been enabled, confirm the device-mapper multipath settings.

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4.2.1 Recognizing the Post device-mapper multipath LUNs

Check the device file created by the device-mapper multipath.

Example:

```
# cd /dev/mapper
# ls -l
total 0
lrwxrwxrwx 1 root root   16 Apr 2 00:44 control -> ../device-mapper
brw------- 1 root root 253,  0 Apr 2 00:44 mpatha
brw------- 1 root root 253,  1 Apr 2 00:44 mpathb
brw------- 1 root root 253,  2 Apr 2 00:44 mpathc
brw------- 1 root root 253,  3 Apr 2 00:44 mpathd
                     :
brw------- 1 root root 253, 23 Apr 2 00:44 mpathu
brw------- 1 root root 253, 24 Apr 2 00:44 mpathv
brw------- 1 root root 253, 25 Apr 2 00:44 mpathw
brw------- 1 root root 253, 26 Apr 2 00:44 mpathx
```


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4.2.2 Checking the device-mapper multipath Status and Created Devices

Check the path status using the "multipath -ll" command. Check that the recognized status of the devices for all the paths that are assigned to the server is normal.

- Multipath is in normal status (This example shows when two paths are used to connect to the ETERNUS DX410)

  Check that multipathing is configured in the two block devices and "active ready" is displayed for each path status.

```
# multipath -ll
mpathb (36000b5d0006a0000006a0317000a0000) dm-2 FUJITSU,ETERNUS_DX400
size=10G features='1 queue_if_no_path' hwhandler='0' wp=rw
`-+- policy='round-robin 0' prio=150 status=active
  |- 3:0:0:1 sdc 8:32 active ready running
  `- 4:0:0:1 sde 8:64 active ready running
:
:
```

When the path status is normal, "active ready" is displayed.

Two block device names are displayed for a two-path configuration.

- Multipath (the "3:0:0:X" side) is in error status (This example shows when two paths are used to connect to the ETERNUS DX410)

```
# multipath -ll
mpathb (36000b5d0006a0000006a0317000a0000) dm-2 FUJITSU,ETERNUS_DX400
size=10G features='1 queue_if_no_path' hwhandler='0' wp=rw
`-+- policy='round-robin 0' prio=150 status=active
  `- 4:0:0:1 sde 8:64 active ready running
:
:
```

The status for the failed path may not be displayed depending on the OS version.

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Chapter 5
For SUSE Linux Enterprise Server 10

This chapter describes how to set up a multipath environment, and the points to be checked after setup when the server is running SLES10.

5.1 For SUSE Linux Enterprise Server 10 SP3 or Later

5.1.1 Setting Up the device-mapper multipath

Set up the multipath environment.

5.1.1.1 Preparation

device-mapper multipath uses Red Hat Package Manager (RPM) packages.

If the RPM versions are not listed in the Server Support Matrix, use the RPM supplied as standard in the OS.

5.1.1.2 Editing "/etc/multipath.conf"

Edit the device-mapper multipath configuration file.

Create a configuration file as follows.

Procedure

1 Copy the "/usr/share/doc/packages/multipath-tools/multipath.conf.synthetic" file to "/etc".

```
# cp /usr/share/doc/packages/multipath-tools/multipath.conf.synthetic /etc/multipath.conf
```

2 Add the following lines to the file.

Add the following lines at the end of the "defaults" section.

```
defaults {
          user_friendly_names yes
        }
```


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Add the following lines at the end of the "devices" section.

(This example is for the ETERNUS DX410)

```
devices {
        device {
                vendor                  "FUJITSU"
                product                 "ETERNUS_DX400"
                prio                    alua
                path_grouping_policy    group_by_prio
                path_selector           "round-robin 0"
                failback                immediate
                no_path_retry           10
                path_checker            tur
               }
       }
```

Caution

- Enter a space between "defaults" and "{".
- Enter a space between "devices" and "{".
- Enter a space between "device" and "{".

The "product" value varies depending on the ETERNUS DX that is to be connected.

Refer to the following table for the appropriate value.

ETERNUS DX to be used	"product" value
DX60 S3/DX100 S3/DX200 S3, DX200F, DX60/DX60 S2, DX80/DX80 S2, DX90/DX90 S2	ETERNUS_DXL
DX500 S3/DX600 S3	ETERNUS_DXM
DX400/DX400 S2 series	ETERNUS_DX400
DX8000/DX8000 S2 series	ETERNUS_DX8000

If any internal disks or other devices are to be excluded from the multipath configuration, specify the excluded devices in the "blacklist" section. Refer to the Novell web-site for details.

End of procedure

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5.1.1.3 Enabling the device-mapper multipath

Enable the device-mapper multipath, using the following commands.

```
# insserv boot.multipath multipathd
# chkconfig multipathd on
# chkconfig boot.multipath on
# /etc/init.d/boot.multipath start
# /etc/init.d/multipathd start
```

One of the following messages may be displayed after the "/etc/init.d/boot.multipath start" command is executed in an environment that has many devices connected.

```
Setup multipath targets/etc/init.d/boot.multipath: line 102:
 /sys/block/dm-*/uevent: No such file or directory
timeout waiting for devices                                          failed
```

or

```
Setup multipath targetstimeout waiting for devices                   failed
```

If one of these messages is displayed, wait for about five minutes, and then execute the "/etc/ init.d/ boot.multipath start" command again.

5.1.1.4 Rebooting the Linux Server

Reboot the Linux server.

Example:

```
# shutdown -r now
```


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5.1.2 Checking the device-mapper multipath

After they have been enabled, confirm the device-mapper multipath settings.

5.1.2.1 Recognizing the Post device-mapper multipath LUNs

Check the device file created by the device-mapper multipath.

Example:

```
# cd /dev/mapper
# ls -l
total 0
lrwxrwxrwx 1 root root   16 Apr 2 00:44 control -> ../device-mapper
brw------- 1 root root 253,  0 Apr 2 00:44 mpatha
brw------- 1 root root 253,  1 Apr 2 00:44 mpathb
brw------- 1 root root 253,  2 Apr 2 00:44 mpathc
brw------- 1 root root 253,  3 Apr 2 00:44 mpathd
                      :
brw------- 1 root root 253, 23 Apr 2 00:44 mpathu
brw------- 1 root root 253, 24 Apr 2 00:44 mpathv
brw------- 1 root root 253, 25 Apr 2 00:44 mpathw
brw------- 1 root root 253, 26 Apr 2 00:44 mpathx
```

5.1.2.2 Checking the device-mapper multipath Status and Created Devices

Check the path status using the "multipath -ll" command. Check that the recognized status of the devices for all the paths that are assigned to the server is normal.

- Multipath is in normal status (This example shows when two paths are used to connect to the ETERNUS DX410)

  Check that multipathing is configured in the two block devices and "active ready" is displayed for each path status.

```
# multipath -ll
mpathr (3600000e00d0000000000422001e0000) dm-20 FUJITSU,ETERNUS_DX400
[size=2.0G][features=1 queue_if_no_path][hwhandler=0]
\_ round-robin 0 [prio=100][active]
 \_ 6:0:0:6 sdaf 65:240 [active][ready]
 \_ 5:0:0:6 sdh   8:112 [active][ready]
:
:
```

When the path status is normal, "[active][ready]" is displayed.

Two block device names are displayed for a two-path configuration.

- Multipath (the "5:0:0:X" side) is in error status (This example shows when two paths are used to connect to the ETERNUS DX410)

```
# multipath -ll
mpathr (3600000e00d0000000000422001e0000) dm-20 FUJITSU,ETERNUS_DX400
[size=2.0G][features=1 queue_if_no_path][hwhandler=0]
\_ round-robin 0 [prio=100][active]
 \_ 6:0:0:6 sdaf 65:240 [active][ready]
 \_ 5:0:0:6 sdh   8:112 [failed][faulty]
:
:
```

The status for the failed path is "[failed][faulty]".

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5.2 For SUSE Linux Enterprise Server 10 SP2 or Earlier

5.2.1 Setting Up the device-mapper multipath

Set up the multipath environment.

5.2.1.1 Preparation

device-mapper multipath uses Red Hat Package Manager (RPM) packages.
If the RPM versions are not listed in the Server Support Matrix, use the RPM supplied as standard in the OS.

5.2.1.2 Editing "/etc/multipath.conf"

Edit the device-mapper multipath configuration file.
Create a configuration file as follows.

Procedure

1 Copy the "/usr/share/doc/packages/multipath-tools/multipath.conf.synthetic" file to "/etc".

```
# cp /usr/share/doc/packages/multipath-tools/multipath.conf.synthetic /etc/multipath.conf
```

2 Add the following lines to the file.
Add the following lines at the end of the "defaults" section.

```
defaults {
          user_friendly_names yes
        }
```

Add the following lines at the end of the "devices" section.
(This example is for the ETERNUS DX410)

```
devices {
        device {
                vendor                  "FUJITSU"
                product                 "ETERNUS_DX400"
                prio_callout            "/sbin/mpath_prio_alua %d"
                path_grouping_policy    group_by_prio
                path_selector           "round-robin 0"
                failback                immediate
                no_path_retry           10
                path_checker            tur
               }
       }
```


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Caution

- Enter a space between "defaults" and "{".
- Enter a space between "devices" and "{".
- Enter a space between "device" and "{".

The "product" value varies depending on the ETERNUS DX that is to be connected.

Refer to the following table for the appropriate value.

ETERNUS DX to be used	"product" value
DX60 S3/DX100 S3/DX200 S3, DX200F, DX60/DX60 S2, DX80/DX80 S2, DX90/DX90 S2	ETERNUS_DXL
DX500 S3/DX600 S3	ETERNUS_DXM
DX400/DX400 S2 series	ETERNUS_DX400
DX8000/DX8000 S2 series	ETERNUS_DX8000

If any internal disks or other devices are to be excluded from the multipath configuration, specify the excluded devices in the "blacklist" section. Refer to the Novell web-site for details.

End of procedure

5.2.1.3 Enabling the device-mapper multipath

Enable the device-mapper multipath, using the following commands.

```
# insserv boot.multipath multipathd
# chkconfig multipathd on
# chkconfig boot.multipath on
# /etc/init.d/boot.multipath start
# /etc/init.d/multipathd start
```

One of the following messages may be displayed after the "/etc/init.d/boot.multipath start" command is executed in an environment that has many devices connected.

```
Setup multipath targets/etc/init.d/boot.multipath: line 102:
 /sys/block/dm-*/uevent: No such file or directory
timeout waiting for devices                                    failed
```

or

```
Setup multipath targetstimeout waiting for devices             failed
```

If one of these messages is displayed, wait for about five minutes, and then execute the "/etc/ init.d/ boot.multipath start" command again.

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5.2.1.4 Rebooting the Linux Server

Reboot the Linux server.

```
# shutdown -r now
```

After rebooting, the following warning message may appear in the "/var/log/message". However, there is no actual problem with multipath configuration and operation.

```
Jun 30 16:15:00 nvcs2 multipathd: sdb: Using deprecated prio_callout '/sbin/mpath_prio_alua %d'
(controller setting)      Please fixup /etc/multipath.conf
```

5.2.2 Checking the device-mapper multipath

After they have been enabled, confirm the device-mapper multipath settings.

5.2.2.1 Recognizing the Post device-mapper multipath LUNs

Check the device file created by the device-mapper multipath.

Example:

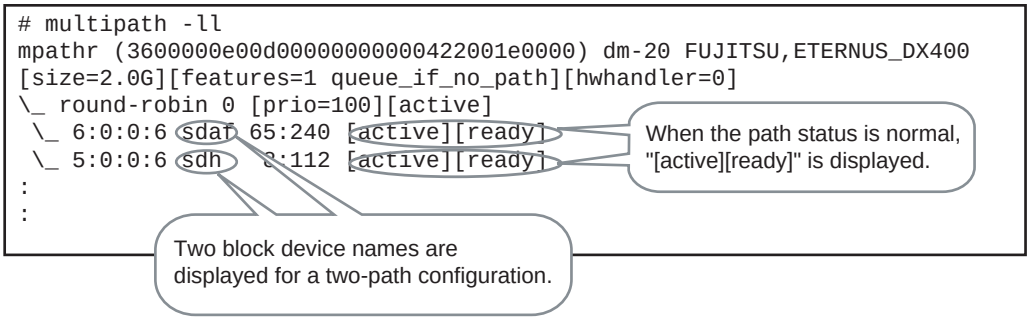
```
# cd /dev/mapper
# ls -l
total 0
lrwxrwxrwx 1 root root   16 Apr 2 00:44 control -> ../device-mapper
brw------- 1 root root 253,  0 Apr 2 00:44 mpatha
brw------- 1 root root 253,  1 Apr 2 00:44 mpathb
brw------- 1 root root 253,  2 Apr 2 00:44 mpathc
brw------- 1 root root 253,  3 Apr 2 00:44 mpathd
                       :
brw------- 1 root root 253, 23 Apr 2 00:44 mpathu
brw------- 1 root root 253, 24 Apr 2 00:44 mpathv
brw------- 1 root root 253, 25 Apr 2 00:44 mpathw
brw------- 1 root root 253, 26 Apr 2 00:44 mpathx
```

5.2.2.2 Checking the device-mapper multipath Status and Created Devices

Check the path status using the "multipath -ll" command. Check that the recognized status of the devices for all the paths that are assigned to the server is normal.

- Multipath is in normal status (This example shows when two paths are used to connect to the ETERNUS DX410)

  Check that multipathing is configured in the two block devices and "active ready" is displayed for each path status.



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- Multipath (the "5:0:0:X" side) is in error status (This example shows when two paths are used to connect to the ETERNUS DX410)

```
# multipath -ll
mpathr (3600000e00d0000000000422001e0000) dm-20 FUJITSU,ETERNUS_DX400
[size=2.0G][features=1 queue_if_no_path][hwhandler=0]
\_ round-robin 0 [prio=100][active]
 \_ 6:0:0:6 sdaf 65:240 [active][ready]
 \_ 5:0:0:6 sdh   8:112 [failed][faulty]
:
:
```

The status for the failed path is "[failed][faulty]".

For SLES10, the following message may appear in the path status after executing the "multipath -ll" command. However, there is no actual problem with multipath configuration and operation.

```
sdaf: Using deprecated prio_callout '/sbin/mpath_prio_alua %d' (controller setting)
      Please fixup /etc/multipath.conf
sdh: Using deprecated prio_callout '/sbin/mpath_prio_alua %d' (controller setting)
     Please fixup /etc/multipath.conf
```


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FUJITSU Storage ETERNUS DX Configuration Guide -Server Connection- (Fibre Channel/FCoE/iSCSI/SAS) for Linux device-mapper multipath

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